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ABSTRACT

An autosegmental account of the child's acquisition of grammatical tone in Sesotho, a southern Bantu language, is presented. The following theoretical questions are addressed: (1) When and how does the child figure out that Sesotho is a tonal rather than intonational, stress, or accentual language?; (2) How does the child acquire tonal rules?; and (3) When do children become aware of Obligatory Contour Principle (OCP) effects that prohibit two consecutive high tones from occurring on the tonal tier? Data are drawn from the speech of a monolingual Sesotho speaking child in spontaneous utterances during interactions with siblings, parents, and grandparents at ages 2.1, 2.6, and 3.0 years. Results suggest that at 2 years the child knows that he is learning a grammatical tonal rather than a stress/intonational, lexical tonal, or accentual language. An initial rule of interactive high tone spread on verbs at two years gives rise to morphological tone rules, a rule of high tone deletion, and the lexical distinction of verbs by 3 years. Finally, it appears that the effects of OCP are learned much as other tonal rules, around the same time as the other verbal melody tone patterns begin to emerge. A 14-item bibliography is included. (MSE)

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Problems in the Acquisition of Grammatical Tone*

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1. Introduction

The development of autosegmental phonology (e.g. Leben 1973, Williams 1976, Goldsmith 1976) represents one of the most important advances in the development of phonology since the generative insights of The Sound Pattern of English (SPE) (Chomsky & Halle 1968). Yet the field of acquisition has been slow to adopt and integrate new perspectives from theoretical phonology, much the same as it has been slow to adopt and apply theoretical insights in the area of syntax. The present study attempts to address this issue by developing an autosegmental account of the acquisition of grammatical tone in Sesotho, a southern Bantu language. While this work represents the first stages of on ongoing research project, it raises several theoretical questions that will hopefully serve as a model for future study in this area. In particular it addresses three questions: 1) When/how does the child figure out that Sesotho is a tonal, rather than an intonational, stress or accentual language? 2) How does the child acquire tonal rules? 3) When do children become aware of OCP effects?

2. The Prosodic Acquisition Problem

In order to address the Prosodic Acquisition Problem we need to have a model or theory of what prosodic systems look like. For the purposes of this paper I will assume a model of Lexical Phonology along the lines of that developed by Kiparsky (1982, 1985) and Mohanan (1982, 1986). A model of lexical phonology allows us, and presumably the child, to specify where and how pitch is assigned. Languages will differ to the extent that they assign pitch to various domains (i.e. morae, syllables, words) and at various parts of the grammar (i.e. stipulated underlyingly, assigned lexically and/or assigned postlexically), and to the extent that pitch assignment may interact with other linguistic phenomena such as stress.

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The problem for the child is to figure out 1) whether the language s/he is learning is a lexical tonal (e.g. Chinese), stress/intonational (e.g. English), accentual (e.g. Japanese, some Bantu languages) or a grammatical tonal language (Sesotho and other Bantu languages), 2) what tonal rules apply and where they apply (in the lexical or postlexical component, and 3) if there are any OCP effects.

3. Acquisition of Sesotho Tone

The data for this study come from a monolingual Sesotho-speaking child whose spontaneous utterances during interactions with siblings, parents and grandparents were sampled at 2;1, 2;6 and 3;0 years.[1] Only High (´), Lowered High (+) and falling (^) tones are marked.[2] A subset of affirmative present tense utterances are considered here. The data are not intended to be statistically significant, but rather provide an indication of general tendencies in the child's developing prosodic system.

Sesotho word order is (S)V(O). This paper will focus on the verbal complex which is composed of the following morphemes:

(1) (S) SM-(T/A)-(OBJ)-V-(EXT)-M (O)[3]

In the following discussion I will assume an autosegmental analysis with separate segmental and tonal tiers. Though Sesotho can be analyzed as having only High (H) tones, with Low (L) tone as the default value (Kisseberth 1989), I will refer to both H and L tones for ease of reference.

4. A Tonal vs. Intonational, Stress or Accentual System

At 2;1 years the child most frequently has a HL (or H+) final pattern at the end of many utterances, but not necessarily at the end of medial clauses, as in (2).

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1 Age is represented in years and months: 2;1 years = 2 years and 1 month.

2 Studies of the acquisition of phonology have shown that that is a certain amount of individual variation in phonological development. We might therefore expect some individual variation in the types of tonal acquisition patterns exhibited by different children. However, the present study of one child will hopefully identify some of the issues. Analysis of data from a second child at the same ages is currently in progress.

3 Lesotho orthography is adapted here, resulting in a broad phonetic transcription, though mid vowels follow the non-distinctive orthographic conventions. The second person singular subject marker *u*, is rendered here as *o* (phonetically identical to third person singular subject marker, except that third person is High tone). The present tense subject marker (SM) assumes an *-a* when the verb is final in the verb phrase. Gloss abbreviations are as follows: AGR=agreement marker, APL=applicative/benefactive, COP=copula, DEM=demonstrative pronoun, DIM=diminutive, EXT=verbal extension, M=mood, OBJ=object clitic, POSS=possessive, PN=independent pronoun, suffix, PREP=preposition, SM=subject marker, T/A=tense/aspect, WH=question word, 8=noun class 8, 2s=second person singular.

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(2) 2;1 yrs. *ánká ké ená*
(ke-a-ńk-a+ ké e-na)
1sSM-PRES-take-M COP 9-DEM
'I'm taking (it), here it is'

However, he more accurately produces clause final HL by 2;6 years (3), and is even more consistent by 3 years, possibly indicating access to the syntax through prosodic cues.

(3) 2;6 yrs. *tél:a wa wakhutsanyáne*
(o-a-téll-a ó-mo-khútswa-nyáne)
2sSM-PRES-disrespect-M 1AGR-1SM-short-DIM
'you're disrespectful, you shorty'

While the child's productions at 2;1 years might be consistent with an intonational analysis, it appears that by 2;6 years he has learned the tonal rule of phrase final lowering.

Sesotho has a phonological rule of penultimate lengthening (=stress?) which is especially prominent at the end of clauses and which children fairly consistently produce by 2 years. If the child adopted a stress type of analysis, we would expect the lengthened syllables to be marked with a consistent tone pattern. We have noted above the frequency of a final HL pattern: We might hypothesize that this is evidence of a stress=tone analysis, however further evidence shows that this is not the case. Even where Sesotho would posit a HL final pattern, the child demonstrates inconsistency. Thus, while HL final patterns are very frequent in the child's speech, as well as in the input, the phenomena is not especially robust.

Clements & Goldsmith (1984:16) hypothesize that children learning Bantu languages might adopt an accentual (in the sense used in Clements & Goldsmith 1984) analysis as a strategy for facilitating factorization, or mapping between segmental and tonal tiers in a more linear fashion. While it is not clear exactly what kind of data would address this issue, a closer look at the child's tone on verbs is suggestive.

At 2;1 years, 73% of all verbs, most of them disyllabic, have a tonal pattern of HL in phrase final position, or HH in non-final position (i.e. when an object follows). The fact that so many of the verbs have a H tone on the first syllable might be consistent with an accentual analysis of the type proposed by Clements and Goldsmith (1984), where underlyingly a verb would be associated with a diacritic (*) which would then be interpreted as a High tone at a latter stage of the tonal derivation. But it is difficult to distinguish the effect of marking underlying representations with a diacritic rather than with

a H tone itself (see also Pulleyblank 1986). On either analysis the important factor is that the child is treating most verbs in the same way. One would therefore have to look for other evidence, such as when/at what level, lexical tones are assigned in the child's grammar. A closer look at the child's productions shows that there is developmental trend toward distinguishing two groups of verbs; this is as shown in Table 1.

Lexical Tone (Verbs)						
	Total H	Surface		Total L	Surface	
Age (y;m)		H	%		L	%
2;1	32	26	0.8	20	8	0.4
2;6	32	26	0.8	31	17	0.6
3;0	8	6	0.8	8	8	1.0
High tone on first syllable of verbs with L SMs						

Table 1.

Thus, while verbs are more consistently marked as H at 2 years (4)-(5), they have been differentiate into H and L by 3 years (6)-(7).

(4) 2;1 yrs.
tea hána
(ke-a-hán-a+)
1sSM-PRES-refuse-M
'I refuse'

(5) 2;1 yrs.
a-kúla
(o-a-kul-a)
2sSM-PRES-sick-M'
you are sick'

(6) 3;0 yrs.
o-ngólá lengolo?
(o-ngól-á le-ngólo)
2sSM-write-M 5-letter
'Are you writing a letter?'

(7) 3;0 yrs.
ke-kopa motoho
(ke-kop-a mo-tohó)
1sSM-ask-M 3-porridge
'I'm asking for porridge'

I suggest the there is ample evidence from the input for initially construing disyllabic L verbs as H (due to High Tone Spread from subject markers). It could well be that the child's initial hypothesis is that all verbs are lexical H toned. The appropriate underlying lexical tone of verbs would then be acquired gradually on a item by item basis within the lexicon, or until facility with other verbal melodies forced a reanalysis of lexical tones. Evidence for this proposal comes from the fact that certain high frequency verbs such as H toned *hana* 'refuse' and L toned *batla* 'want' are more consistently produced as such by 2;6 years than are other less frequent verbs (both in input as well as in the child's productions), and that lexical tones on verbs are largely in place by 3 years when morphological tone phenomena are being acquired.

We might then predict that the acquisition of tone on subject markers would either 1) parallel that found for verbs (i.e. all subject markers will be initially

marked as H), or that 2) there will be an early and consistent distinction between H and L subject markers. Unlike with the more uniform marking of verbs as H, there is a more consistent (perhaps underlying?) tonal distinction between H and L subject markers around the age of 2, as shown in Table 2.

Lexical Tone (SMs)						
	Total H	Surface		Total L	Surface	
Age (y;m)		H	%	Low	L	%
2;1	13	11	0.8	49	40	0.8
2;6	21	18	0.9	53	44	0.8
3;0	13	6	0.5	16	13	0.8
SM=H/L - H & L Verbs						

Table 2.

There is 80% accuracy in the marking of both H and L toned subject markers at 2;1 years of age, as in (8) and (9) where the majority (78%) of the L toned subject markers at 2;1 years are the 1st person singular subject marker *ke* 'I', as in (9).

(8) 2;1 yrs.
é a kae?
(ó-y-á kae?)
1SM-go-M where
'where is s/he going?'

(9) 2;1 yrs.
a echá hápe
(ke-ets-a hápɛ)
1sSM-do-M again
'I'm doing (it) again'

The marking of L toned subject markers as L is consistent across time (10). This differs from the marking of H toned subject markers, where there is an actual decline in the appropriate tone marking by 3 years, as shown in (11).

(10) 3;0 yrs. *roná re-ngola káng?*
(roná re-ngóla ká-ng?)
1pPN 1pSM-write-M PREP-WH
'as for us, what are we going to write with?'

(11) 3;0 yrs. *a-chécha*
(é-á-chech-a)
9SM-PRES-reverse-M
'it's reversing'

I suggest that the decline in appropriate marking of H tone subject markers at 3 years may indicate that the child is beginning to deal with OCP effects (see § 6.).

Based on this preliminary data I suggest that Sesotho-speaking children are well aware by 2 years of age that their language is a grammatical tone

language rather than a purely lexical tonal, stress/intonational, or even accentual language. I now turn to a discussion of tonal rules.

5. Iterative High Tone Spread

There is some evidence that children may have an early rule of Iterative High Tone Spread that persists until the morphological tone patterns (Melodies II and III) begin to be acquired around 3 years. Non-final disyllabic verbs are fairly consistently produced as HH (as in 6), and final trisyllabic verbs as HHL. While there are a few cases of High Tone Doubling (i.e. spreading only to the next syllable), as in (12), the norm seems to be iterative spreading, as in (13).

(12) 2;6 yrs. *séfofánu syá-bídíka kwána*
(sefófáne sé-a-bídík-a kwána)
airplane 7SM-PRES-revolve-M DEM
'the airplane is turning about over there'

(13) 2;6 yrs. *wená á máthélá má::::ne chabadímachetse kwana*
(wená o-math-el-a mâ:né Chabadímaketse kwána)
2sPN 2sSM-run-APL-M DEM Ch. DEM
'you're running WA:Y over there at Chabadimaketse, far away'

There are few examples of four syllable verb stems in the spontaneous corpus. Further experimental study will have to determine the extent of the domain to which the child's rule of Iterative High Tone Spread applies.

Spreading on H tone subject markers is less clear; about half spread iteratively as in (13) above and (14), while others do not spread at all (15). In some cases the subject marker and tense/aspect marker have been collapsed into one syllable where one H tone is retained (16).

(14) 2;6 yrs.
á wélá nth(ò) éná...
(é-á-w-el-a ntho é-na...)
9SM-PRES-fall-APL-M 9thing 9-DEM
'it's falling, this thing...'

(15) 2;1 yrs.
á eta móda
(á-éts-a móna)
4SM-do-M DEM
'they're doing (it) here'

(16) 2;6 yrs. *á nyola kho:fú yéna*
(é-á-nyoloh-a khofú é-na)
9SM-PRES-ascend-M 9shovel 9-DEM
'it's ascending, this dumptruck'

Data from after 3 years, when children more consistently produce preverbal morphemes, will better be able to determine the extent of H tone spread on subject markers.

6. Obligatory Contour Principle (OCP) Effects

The Obligatory Contour Principle, or OCP prohibits two consecutive H tones from occurring on the tonal tier. Solutions to this problem range from conflation of two H's into one H, or alternatively, as found in Sesotho, delinking of one H and filling in with a default L, resulting in a HLH sequence on the tonal tier. Again, it is difficult from spontaneous productions to determine what the child's underlying representations might be. One might interpret some of the child's productions of Iterative High Tone Spread from subject markers as being application of the OCP, where two underlying H tones are conflated into one (17). However, it could also be that the child maintains two underlying H tones, thus violating the OCP; the natural production data render it difficult to distinguish the two analyses. There are some cases where a HLH pattern results, as in (18), but increasingly at 3 years the subject marker is produced as Low (19).

(17) 2;6 yrs.
kolóy yáká é thóthá mokúlú:
(kolóy yá-ká é-thoth-á bo-kúlúbe)
9car POSS-my 9SM-carry-M 14-horse dung
'my car is carrying horse dung'

(18) 2;6 yrs.
bá-kuká mollo
(bá-kuk-á mó-llo)
2SM-take-M 3-fire
'they're taking the flame'

(19) 3;0 yrs. *a-chécha*
(é-á-chech-a)
9SM-PRES-reverse-M
'it's reversing'

I suggest that examples such as (19) may indicate an emerging awareness of a rule of High Tone Delinking, where underlying HH on the tonal tier becomes LH, perhaps a response to the OCP. The status of the OCP as a either a language universal, and therefore part of Universal Grammar (McCarthy 1986), or alternatively as a frequent, but language specific rule (Odden 1986, 1988) is as yet unresolved. It is hoped that further acquisition research may shed some light on the debate.

7. Conclusions

While the findings presented here are still preliminary, there appears to be evidence from spontaneous, natural productions that, at 2 years, the child knows that he is learning a grammatical tonal, rather than an stress/intonational, lexical tonal, or accentual language: There is no evidence of fixed tonal patterns that would imply an accentual analysis, nor a robust correspondence between the penultimate 'stressed' syllable and tone. While verbs are predominantly H, subject markers are distinguished by H/L contrasts. Secondly, an initial rule of Iterative High Tone Spread on verbs at 2 years gives rise to morphological tone rules, a rule of H Tone Deletion, and

the lexical distinction of verb tones by 3 years. Finally, it would appear that the effects of OCP are learned much as other tonal rules, around the same time as the other verbal melody tone patterns begin to emerge.

While this study raises many more questions than it answers, it is hoped that it will stimulate future research not only on the acquisition of prosody, but on the acquisition of phonology as well.

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